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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/777,633	02/13/2004	Geoffrey Alan Scarsbrook	248810US2CONT	5368
22850	7590	03/15/2006	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			MONDT, JOHANNES P	
			ART UNIT	PAPER NUMBER
			3663	

DATE MAILED: 03/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/777,633

Applicant(s)

SCARSBROOK ET AL.

Examiner

Johannes P. Mondt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) 2-10 and 14-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 11-13 and 31-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7/20/5, 5/12/4, 2/13/4 (3 IDS)</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Group I and of Species 5 in the reply filed on 1/9/06 is acknowledged. The traversal is on the grounds that allegedly the restriction/election requirement failed to provide an explanation of "why each group lacks unity with each other group" (sic). This is not found persuasive because such explanation was explicitly formulated, while from the very beginning the restriction requirement and election requirement are based on an identification of the special technical features, as required under PCT practice. Said explanation has not been traverse on its specifics. Furthermore, no explanation has been provided why claim 13 is deemed included in the elected invention. While method of use claims 31-34 are included in the present examination the reason for this is that they are entirely obvious over the single crystal diamond considering the impetus of the prior art. The only reason why claim 1 is included is limitation (v), which is common to claim 1 and claim 13. Examiner sees no reason why applicant insists on a simultaneous examination of the listed technical features through claim 13 despite the restriction / election requirement, with the proviso that claims 31-34 are included in the examination. The requirement is still deemed proper and is therefore made FINAL.

Information Disclosure Statement

The examiner has considered the items listed on the Information Disclosure Statement (IDS) filed 7/20/05; a signed copy of Form PTO-1449 is herewith enclosed.

The examiner does not acknowledge IDS filed 5/12/04 because said IDS is not in compliance with 37 C.F.R. 1.98(a)(1) because no heading identifying the list as an IDS, nor a space reserved for examiner's signature is provided in said IDS. In particular, 37 CFR 1.98(a)(1) requires the following: (1) a list of all patents, publications, applications, or other information submitted for consideration by the Office; (2) U.S. patents and U.S. patent application publications listed in a section separately from citations of other documents; (3) the application number of the application in which the information disclosure statement is being submitted on each page of the list; (4) a column that provides a blank space next to each document to be considered, for the examiner's initials; and (5) a heading that clearly indicates that the list is an information disclosure statement. The information disclosure statement has been placed in the application file, but the information referred to therein has not been considered.

The information disclosure statement filed 2/13/04 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. **Claims 1, 31, 32 and 34** are rejected under 35 U.S.C. 103(a) as being unpatentable over Marinelli et al (Applied Physics Letters 75 (20), pp. 3216-3218 (1999)) in view of Vichr et al (5,443,032).

Marinelli et al teach a top layer "almost free of grain boundaries" (see page 3218, first column, final paragraph), i.e., almost a single crystal, having the following characteristic: a high collection distance greater than about 150 μm measured at an applied field of 10 $\text{V}/\mu\text{m}$ and 300 K temperature: please note that Figure 2 shows that the efficiency (i.e., the ratio of collected charge to total charge) at 10 $\text{kV}/\text{cm} = 1 \text{ V}/\mu\text{m}$ is about 60% of the efficiency at 40 kV/cm , while, for particles to be detected for which the penetration depth G is much greater than a quarter of the collection distance the lifetime and collection distance are limited only by impurities and the (almost absent) grain boundaries, which is the situation discussed by Marinelli et al (page 3216, second column); see Eq.(3) and discussion directly underneath. In light of the straightforward, direct and homogenous linearity between collection distance and efficiency (see Eq. (3)) the teaching by Marinelli et al of a charge collection distance of about 250 μm at 4 $\text{kV}/\mu\text{m}$, i.e., at 4 $\text{V}/\mu\text{m}$, in conjunction with Figure 2 implies a charge collection distance δ of about 150 μm for 1 $\text{V}/\mu\text{m}$.

N.B.: Marinelli et al also teach the diamond to be made by CVD, however applicant is alerted to the irrelevance for the present device application of the limitation "prepared by CVD": In reference to the claim language referring to "prepared by CVD", intended use and other types of functional language must result in a structural

difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963).

Marinelli et al neither teach the diamond to be a "single crystal" diamond, merely indicated said diamond to be "almost free of grain boundaries for most of its thickness", nor said collection distance to be "greater than" rather than merely about, 150 μm .

However, as pointed out by Marinelli et al, removal of the portion not almost free of grain boundaries could further significantly increase the collection distance (see page 3218, first column, final paragraph) while at the same time said removal would further improve the crystallinity.

Furthermore, it would have been obvious to achieve a single-crystal diamond with collection distance superior to Marinelli et al by selection a CVD method that creates a single crystal diamond in the first place, the possibility of which has long been known in the art, as witnessed by Vichr et al, who, in a patent on electronic grade diamond teach the manufacturing of large single crystal diamonds for instance by CVD (see abstract and col. 6, l. 29-44). Thereby, one of the factors limiting collection distance, i.e., grain boundaries, are removed and a consequent increase over the 150 μm taught by *Marinelli et al* would result.

Motivation to include the teaching by Vichr in the invention by *Marinelli et al* immediately flows from the consequent increase in collection distance, an electronic

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quality factor, expected by Marinelli et al themselves (see page 3218, first column, final paragraph).

Although Marinelli et al nor Vichr necessarily teach the collection distance to be measured at 300 K not a single indication exist that the measurements were not conducted at room temperature, which is indistinguishable from 300 K in as far as any of the relevant physical quantities are concerned, not in the least because of the very high band gap of diamond; while most applications are devices operating at room temperature. Hence, both from the point of view of practicality of measurements and from the point of view of relevance of the measurements for the contemplated devices it would have been obvious to add the further limitation "at 300 K".

On claims 31-32 and 34: the CVD diamond by Marinelli et al in an electronic application and a detector element, and a detector element comprising a single CVD diamond are entirely obvious over Marinelli et al themselves, as witnessed by their reference to applications in the field of electronics (page 3216, first column, first paragraph) and nuclear particle detection (page 3216, first column, second paragraph). Motivation for the application of the CVD diamond by Marinelli et al immediately derives from the very purpose why CVD diamonds are being researched and manufactured as witnessed by Marinelli et al themselves in the cited portions.

2. **Claims 11-12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Marinelli et al Applied Physics Letters 75 (20), pp. 3216-3218 (1999) and Vichr as applied to claim 1 and further in view of Plano et al (5,803,967) (made of record in previous action).

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As detailed above, claim 1 is unpatentable over Marinelli et al in view of Vichr.

Neither of these references necessarily teach the further limitations defined by claims 11 or 12. However, applicant's method of suppressing defects in the single crystal does not appear to distinguish over Plano's method, i.e., surface etching (abstract and col. 4, l. 30-35), while, as in applicant's method, no nitrogen appears to have been used in the CVD process. In the application of Plano's method in this regard the same results on physical parameters would be expected to obtain. Motivation to include the teaching by Plano in the invention by Marinelli et al at least derives from the role of surface defects as the single-most important limiting factor in the substantial absence of grain boundaries, as suggested by Marinelli et al (page 3218, both columns).

3. **Claim 33** is rejected under 35 U.S.C. 103(a) as being unpatentable over Marinelli et al and Vichr as applied to claim 1 above, and further in view of Yoneda et al (Applied Physics Letters 66 (4), pp. 460-462 (1995)).

As detailed, claim 1 is unpatentable over Marinella et al in view of Vichr. Neither necessarily teach the further limitation defined by claim 33. However, application to an optical switch of the CVD grown diamond would have been obvious over Yoneda et al, who teach the application of a CVD grown diamond to an optical switch (see abstract) for its large grain size and large $\mu\tau$ value (i.e., also large value of collection distance, because the collection distance is approximately proportional to the product of mobility and lifetime) (see especially page 461, first column). Obviously, single crystal diamond

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has optimal grain size and offers an obvious improvement over the switch by Yoneda et al. Hence the invention by Marinelli et al is an obvious application to optical switches.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. **Claims 1 and 11** are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 5 and 6, respectively, of copending Application No.10/739,014, in view of Vichr (5,614,019).

While characteristics (i) is the same as characteristic 5) in the copending application, (ii) is obvious considering the material (diamond) at least for use of relative terms "high", characteristics (iii)-(iv) are the same as characteristics 3) and 4) in the copending

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application, while the characteristics 1) and 2) in claim 1 of the copending application are equivalent (see, e.g., Marinelli et al, Eq. 1 on page 3216) the only substantial difference between claims 1 and 11 of the applicant and claims 5 and 6 resides in the limitation on thickness of greater than 2 mm of the layer of VCD diamond. However, it would have been obvious to include said limitation in view of Vichr, who teaches a CVD grown diamond layer with a thickness > 2mm (Example, 3, col. 13), which in view of Marinelli et al represents clear advantage (final page, final column in Marinelli et al).

This is a provisional obviousness-type double patenting rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JPM
March 13, 2006

Patent Examiner:

A handwritten signature in black ink, appearing to read 'J. Mondt', is written over the printed name.

Johannes Mondt (Art Unit: 3663)